Sustainability and Competitiveness in the Renewable Energy Sector

The Case of Vestas Wind Systems*

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Vestas, a Danish company whose beginnings can be traced back to a blacksmith's workshop founded in 1898, has become the world market leader in wind turbine manufacturing. Between 1994 and 2001, Vestas's sales have increased more than tenfold, and the number of employees increased from 643 to 5,240. While its main contribution to sustainability may be seen as increasing the market share of wind energy, thus reducing the environmental impacts of electricity generation, the company has also become a leader in terms of internal environmental management and social sustainability. Until about a year ago, the company was also a phenomenal success story in financial terms, with a share price that would have provided investors participating in the 1998 IPO with a 778% return over a four-year period. Recent industry developments, however, are more challenging for Vestas, and it remains to be seen whether the company can take its success story to the next level. This paper presents key milestones in the company's development from niche to mass market and analyses success factors in the relationship between Vestas's sustainability performance and business competitiveness.

- Sustainability
- Renewable energy
- Wind energy
- Denmark
- Entrepreneurship
- International management
- Marketing
- Growth

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Vestas's history: from niche to mass market

1898–1978: the early days of Vestas

THE ROOTS OF VESTAS DATE BACK TO THE END OF THE 19TH CENTURY, WHEN blacksmith H.S. Hansen opened his first workshop at Lem, Denmark.[1] According to Vestas's history, Smith Hansen had a reputation for creating many ideas and showing fearless initiative, inspiring many of his colleagues at the time to start their own businesses and thus contributing to the emergence of an important centre for the blacksmith's craft at Lem. It was not until 30 years later that H.S. Hansen and his son, Peder Hansen, founded their first industrial company, Dansk Staalvindue Industri, a manufacturer of steel window frames for industrial buildings. After the Second World War, Peder Hansen formed a new company, Vestjysk Stålteknik A/S, which subsequently changed its name to Vestas. With a start capital of DKK 75,000, the Vestas team moved into manufacturing household appliances and kitchens. Over the following 15 years (1945–1960), the company's product range evolved continuously, from appliances to agricultural trailers to intercoolers. In 1960, Vestas's offices and warehouse burned to the ground and the factory had to be rebuilt. As a consequence, the company faced several years of consolidation, until it identified, in 1968, hydraulic cranes for light lorries as a promising new product area, which proved to be a major export success. A couple of years later, as the two oil crises of the 1970s hit the transport industry and lorry crane sales declined, Vestas had to look for yet another growth area.

1979–1985: first steps in wind turbine manufacturing

Inspired by the second oil crisis in 1978/79, Vestas began to examine the potential of wind turbines as an alternative source of energy. Initially, it chose the Darrieus turbine design, but after 18 months of experiments the company decided to focus on a three-blade model, which soon became the dominant design in the wind industry. In 1979, the first wind turbines were delivered to Danish customers. Subsequently, the industry experienced its first boom, mainly driven by government incentives in Denmark and the United States. Vestas started serial production of 55 kW wind turbines in 1980. By 1985, the number of employees increased to 800. It was also in 1985 that Vestas introduced pitch-regulation, a major technological innovation that optimises the energy output of a wind turbine by constantly adjusting the angle of the blades to current wind conditions. By the end of that same year, Vestas had sold 2,500 wind turbines to the US.

1986: crisis and turnaround

The strong exposure to the US market turned from a blessing into a curse for Vestas when, at the end of 1985, the California tax credit legislation expired. As a consequence, Vestas's US market collapsed and, after a rescue plan failed, it filed for bankruptcy in October 1986. As the reason for the collapse lay primarily in the change of the regulatory framework rather than in Vestas's products, a major restructuring finally led to the establishment of a new company called Vestas Wind Systems A/S in 1987. After large parts of the Vestas Group had been sold off, the new company emerged as a wind energy

1 Unless indicated otherwise, data in this section is taken from *The Vestas History* (Vestas 2003b), published by the company (www.vestas.com/profil/historie/UK/1898_1969_UK.html), as well as a variety of other company publications, particularly annual reports and stock exchange announcements.

pure play, managed by the new CEO, Johannes Poulsen, with a dedicated team of 60 employees.

1987–1997: strong organic growth

It soon became apparent that the new Vestas was set to become a unique success story. The years 1987 to 1997 saw a sequence of international expansion, technological innovation and ever-larger orders. The company set up subsidiaries in India (1987), Germany (1989), Sweden, the US (both in 1992), and formed the joint venture, Gamesa Eolica, in Spain (1994), where Vestas holds 40% of the shares and Gamesa, the parent company, 51%. The Spanish market became particularly important in the mid-1990s, when large utilities started placing large orders to benefit from government incentives. In terms of technology, Vestas gradually increased turbine size—as did the other industry players—with every new generation of their product. Having entered the wind turbine business with a 55 kW machine in 1980, the company introduced its V39-500 kW turbine in 1990, followed by the V44-600 kW turbine in 1994 and the V66-1.65 MW turbine in 1997. Today, the company is operating the first prototypes of its V90-3.0 MW turbine scheduled for serial production in 2004.

Most of Vestas's exceptional growth during this period was organic, accelerated only by selected acquisitions: DWT, Danish Wind Technology, in 1989 and Costas Computer Technology A/S, a long-standing supplier of software and components for Vestas's wind turbine control systems, which was taken over in 1999. When expanding into new international markets, the company often chose to form a joint venture together with a well-established partner in the target country, as was the case with Vestas RRB India Ltd, or the joint venture with Energy System Taranto S.p.a. in Italy. In countries where Vestas felt comfortable that it knew the market, however, it went in with fully owned subsidiaries, as in the US, Sweden and Germany.

This decade also saw Vestas's first turbine deliveries to a smaller offshore project, involving ten 500 kW turbines in the Baltic Sea in 1995. Also in 1995, the company exceeded 1,000 employees for the first time and generated more than €200 million in revenues, a 66% growth rate over the previous year (for convenience, all financial figures in this paper have been converted from Danish crowns to euros at the exchange rate of May 2003 [1 DKK = €0.13475]). It became increasingly clear that, in order to maintain the pace of growth, the company needed additional sources of capital. Two years later, in 1997, the company introduced two new turbine models and consequently posted a slight loss, despite sales growth (in MW) of 24%. Therefore, in early 1998 CEO Johannes Poulsen announced that the time had come to float the company on the Copenhagen Stock Exchange, stating that, in his opinion, 'there is no doubt that in future environmental factors will play an increasingly large role in any political and probably also any commercial decision'.[2]

1998–2001: IPO and hypergrowth

Vestas's initial public offering in April 1998 was a big success. The shares were eight times oversubscribed and the company raised €175 million of fresh equity capital to finance its future growth, including new international subsidiaries and new fibreglass production and turbine assembly facilities. In the year of the IPO, Vestas increased revenues by 45% and started production in its newly established Italian subsidiary in July 1998. Within its first year, the Italian subsidiary generated revenues of €35 million with just 50 employees. 1999 saw the opening of a new blade factory in south-eastern

1 Press release announcing initial public offering (IPO), 23 March 1998.

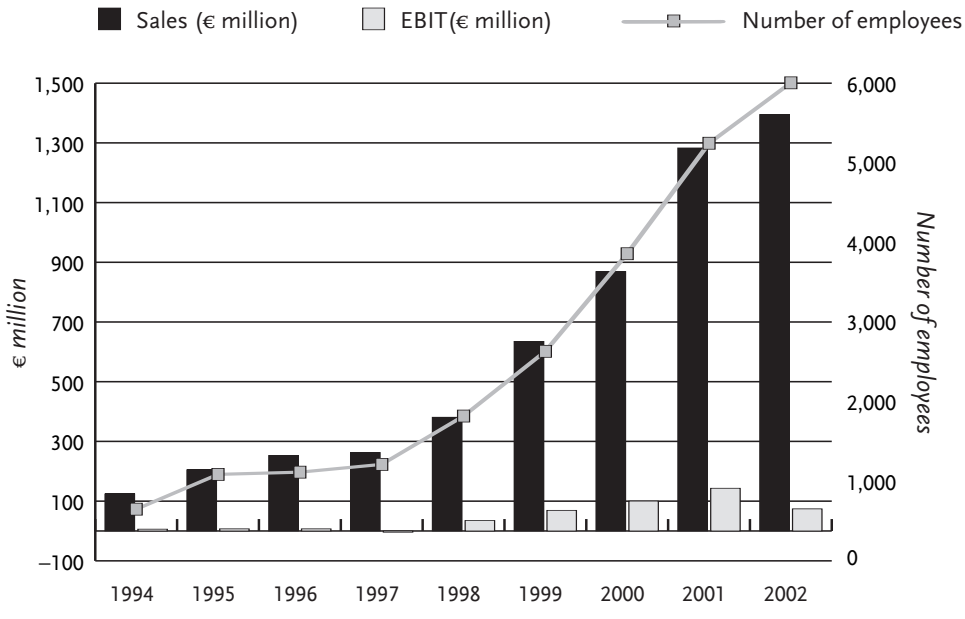


Figure 1 GROWTH IN VESTAS SALES, EARNINGS BEFORE AND AFTER TAX (EBIT) AND NUMBER OF EMPLOYEES 1994–2002

Source: Vestas company data

Denmark, an area of high unemployment that provided good recruiting opportunities for Vestas, as well as the launch of a prototype V80-2.0 MW turbine. 1999 became another record year for Vestas, largely because of exceptional growth in the US market. At the end of 1999, the production tax credit (PTC), an important financial incentive to wind energy generators in the US, expired. Thus, a large number of project developers ordered turbines before the end of the year to take advantage of the incentive. As a result, Vestas increased sales by 66% and more than doubled profits compared with the previous year. In 2000, growth continued, fuelled, among other things, by the largest order ever for wind turbines, received by Vestas's Spanish joint venture Gamesa from Energia Hidroeléctrica De Navarra, worth more than €600 million. Vestas also expanded to Japan, co-operating with Toyota and Kawasaki, and received large orders from FPL Energy LLC in the US following extension of the PTC for two years.

2001 brought more good news for Vestas, when it was chosen as the supplier for the first major offshore project in the North Sea (Horns Reef), the largest offshore order to date, worth around €130 million. 2001 was also the year with the strongest growth in the global wind energy market in history, increasing by 51% over 2000 levels. In this year, Vestas achieved a market share of 24.1% and was clearly the market leader. However, 2001 can also be seen as a turning point in Vestas's history in several respects. Remarkably, on the morning of 11 September 2001, the company announced that 59-year-old CEO, Johannes Poulsen, who had led the company since it was formed in 1987, had decided to resign from his position at the General Meeting in April 2002. Also, increasing strategic differences between Vestas and Gamesa led to a sale of Vestas's 40% stake in the joint venture in December 2001. In hindsight, Vestas had ultimately helped to grow a major competitor that was now seeking independence. Finally, the outlook for the US market looked uncertain following another expiration of the PTC. Owing to altered

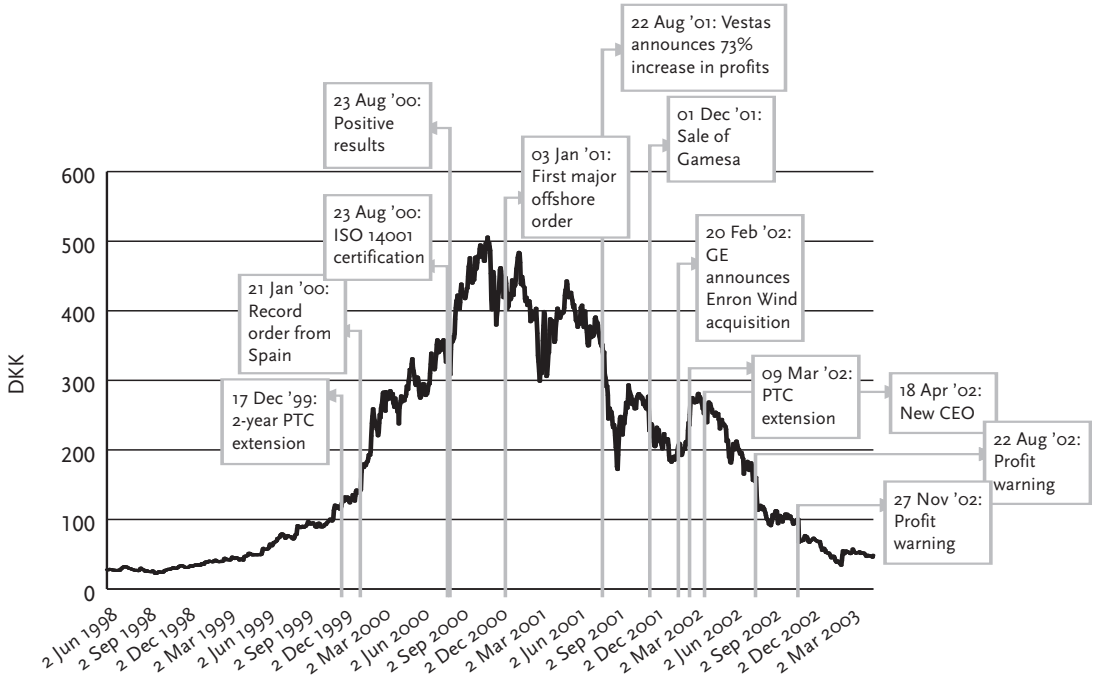


Figure 2 MAJOR EVENTS INFLUENCING VESTAS'S SHARE PRICE OVER THE PAST FIVE YEARS
Source: Data from Copenhagen Stock Exchange, events from company publications, industry associations

political priorities in the aftermath of 11 September and contentious issues in the proposed US energy bill, PTC extension was eventually delayed until March 2002. The company ended 2001 with 5,240 employees, a tripling in the three years since the IPO.

2002 onwards: changing of the guard and new challenges

The beginning of the post-Poulsen era at Vestas was challenging in many ways. The inauguration of Svend Sigaard, the former CFO and new CEO, was accompanied by the news that a major competitor had entered the market: General Electric (GE). The large US engineering conglomerate announced in February 2002 that it had acquired the assets of Enron Wind. GE's entry was not just negative news: after all, it also provided the industry with a lot of credibility because an established player was acknowledging the growth potential in the wind market. It may also not be fully accidental that legislation extending the PTC was passed only five weeks after GE had announced its market entry. Nevertheless, given GE's expertise from the conventional power business, its strong distribution channels in North America and its financial strength, this clearly became an important new competitive threat for Vestas. After the first year of operating in the wind industry, GE is now expected to achieve 45% market share in the US, partly selling to its own projects developed by GE Wind, while Vestas's sales in the US market seem to have slowed down. The development of the euro/dollar currency exchange rate accentuates the challenge for Vestas. In addition, during 2002, Vestas struggled with technical problems on its new flagship V80-2.0 MW turbine and faced delays at the high-

profile Horns Reef offshore project, which eventually resulted in cost overruns of €15–17 million. Looking positively at this, Vestas has had an opportunity to learn important lessons for the emerging growth market of offshore wind parks, and is now established as the market leader in the European offshore market with a 37% market share. Also, thanks to its size, Vestas is better positioned to cope with the larger risks in this market than most of its competitors (except GE and Gamesa).

In contrast to the previous boom years, 2002 ended with the company's announcement that, after the second profit warning in three months, it had to lay off 495 employees, the first downsizing since 1986.

Sustainability performance and business competitiveness at Vestas: key success factors

Looking at the development of Vestas from a bankrupt company in 1987 to the world market leader in wind energy in 2001, a number of key factors can be identified that have contributed to successful growth. Five important points are discussed below: (1) Vestas's vision for both the company and the industry; (2) the management of internal growth; (3) international expansion; (4) the politics of wind energy; and (5) social responsibility and environmental management.

A clear vision for Vestas and the industry

A strong point differentiating Vestas from many of its peers is that the company has always had a very clear vision and strategy that was simple to communicate and thus to be shared by its employees and stakeholders:

> With quality and care we use the wind to generate competitive, clean and renewable energy. In the future, this energy will cover a substantial part of the global energy supply and contribute to sustainable development for the benefit of future generations. Vestas is to be the international market leader in the field of wind power systems—valued by customers, shareholders, employees and other stakeholders (Vestas 2003a: 8).

Unlike, for example, many of the large utility subsidiaries looking at the renewable energy market, Vestas is clearly convinced that this sector will experience strong growth and is determined to lead the market. A number of Vestas's actions also showed that they understood that one company could not build the market alone and that there was room for others to grow as well. In addition to their vision, other elements of Vestas's mission statement were also well thought through. For example, Vestas calls its core values, which are the foundations of its corporate culture, 'integrity, care, the power to act, and development'. This shows that they are aware of the trade-off between being a reliable and trustworthy partner on the one hand, and the necessity to take initiative and be competitive on the other. In fact, this can be seen as a very conscious interpretation of the two facets inherent in sustainable development.

Finally, Vestas also had a very clear-cut strategy to achieve its goal of being an international leader with sufficient financial strength to continue internationalisation: 'Vestas' strategy is to supply customised wind power solutions based on standard wind turbines and standardised options that can generate electricity of the optimal quality at the most competitive price' (Vestas 2003a: 9).

Again, this demonstrates how the company was well aware of the trade-offs it had to cope with as a growing company. As a market leader, it had to focus on relatively standardised products, and was careful to adapt the level of customisation to the needs

of appropriate target segments. This also meant that, unlike in its early days, Vestas was not the number one supplier for a small farming co-operative that wanted to buy just one turbine. Leaving this market for smaller competitors, it managed to satisfy large customers such as FPL Energy, a subsidiary of a major US utility, which buys hundreds of wind turbines at a time. Vestas was also conscious of the importance of competitive prices for the industry to grow, and was committed to delivering lower cost per kWh with every new product it launched. This was key for wind energy to become cost-competitive with conventional power generation, and consequently to develop from a green niche to the mainstream power market.

Managing internal growth

The next step from having a well-formulated vision and strategy is to put it into practice, including the important issue of organisational development to manage growth. Here again, Vestas did an extraordinary job. Four examples illustrate this.

1. When Vestas set up new facilities, it formed 'flying squads', consisting of staff from existing operations across the company. For example, when the new Italian subsidiary was formed in 1998, employees from the Netherlands and Germany, who had gone through the process of starting up operations in their own facilities, went to Italy for a limited period of time to train the local staff and supervise the ramp-up process. This had two positive effects for the company: first, new capacity came online much faster and smoother and, second, the assignment to a foreign subsidiary was a motivating form of job enrichment for the members of these teams.
2. Even before managing the ramp-up process, Vestas acted wisely when it came to choosing locations for new facilities. These were usually situated in areas of high unemployment, which made it convenient for Vestas to hire skilled and unskilled labour. Setting up a blade factory in Nakskov, Denmark, in 1999/2000 was one such example, and the location of the German blade factory in Lauchhammer, in the heart of the former East German brown coal district, was no less prudent. The inauguration of the factory in the middle of the 2002 federal election campaign by German Chancellor, Gerhard Schröder, received positive media coverage, since Vestas's investment represented one of the few growth sectors in the middle of a region with 20% unemployment.
3. Another aspect of managing internal growth is to take care of employee retention and enable the staff members to take a fair share of the company's success. This was achieved through employee share programmes, which were very well received among the staff. For example, in November 2000 more than 80% of employees entitled to purchase Vestas shares made use of this option.
4. Vestas has consistently put special emphasis on training its employees. In 2002, the company went one step further by founding the Vestas School, which also works with external training providers.

These examples show how managing internal growth has become one of Vestas's core competences and illustrate how the company could possibly cope with annual growth rates of more than 30% throughout a decade.

International expansion

As mentioned above, Vestas's vision showed that the company's frame of reference was the international market from the very beginning. In fact, the old Vestas, in the 1950s,

had a tradition of exporting a substantial part of its production to other countries. This of course also reflected the relatively limited size of the Danish home market. Nevertheless, this international orientation helped the company to gain a competitive edge over many of its competitors in the wind industry that were more nationally focused. The strong presence on the North American market in particular has, of course, also been the source of painful lessons for Vestas, probably most pronounced in the mid-1980s. The company has learned its lesson, and recognised that broader international diversification is the best way to manage risk and grow continuously despite the boom-and-bust cycles in some markets. Between 1987 and 2001, the company set up ten international subsidiaries across three continents. This diversified portfolio paid off in 2002 when the large US market—where Vestas had traditionally held a leading position—declined by 75% year-on-year. Thanks to a growth of 45% in markets outside the US, Vestas could still slightly increase its 2002 sales (Vestas 2003a: 21).

Looking at the apparent success of Vestas's internationalisation, however, one should not gloss over the challenges that the company met on the way. A particular example of things not going smoothly was the experience with Gamesa in Spain. When Vestas originally entered into the joint venture, Gamesa Eolica, in 1994, it anticipated building yet another subsidiary that would help to grow the market for Vestas technology in Spain. Initially, expectations were met, as the strong sales growth in the Spanish market demonstrated. However, over time strategic differences emerged over the relative contribution of the two partners to the success. This latent conflict intensified when Gamesa decided to go public in 2000, using the growing wind energy sector as a key argument to convince investors of its attractiveness. In fact, however, Gamesa did not have any proprietary technology, but licensed the technology from Vestas. In addition, the licence was exclusively limited to the Spanish market, so Gamesa under the existing constellation could not grow into markets such as Italy and Greece. Vestas considered different options to solve the conflict, but realised that, given the ownership structure, there was no way for it to get beyond a 49% minority holding in Gamesa Eolica. So, even if it led to a substantial loss of licence fees from Spain and, longer-term, to the creation of a serious competitor, in December 2001 Vestas decided to sell its 40% stake in Gamesa Eolica for €287 million to Gamesa, the parent company. The fact that the price of the transaction was largely regarded as relatively favourable for Gamesa once again underlined Vestas's commitment to integrity and to the development of the wind industry as a whole rather than focusing on short-term gains.

The politics of wind energy

The electric power sector is a heavily regulated industry and, in the case of renewables, the role of government incentives to bring these young technologies to market adds to the importance of politics. Looking at the growth of wind turbine capacity over the past decade, two conclusions can be drawn. First, among all renewable energies, wind energy is certainly the one that is closest to making the transition from niche to mass market, with more than 30,000 MW capacity installed worldwide and annual growth rates of 33% over the past five years (see Fig. 3). Second, Germany and Spain account for more than half of the world market today, and these markets have largely been driven by government regulation. Both countries, through their feed-in tariffs, pay relatively generous incentives to wind energy generators that enable cost competitive wind power production at good and medium-quality sites. Going forward, government policies aimed at mitigating climate change are expected to further support wind energy. Governments also play a role in providing start-up incentives for offshore projects in some countries. So, the importance of politics is probably here to stay, although costs continue to come down and are as low as 2–3 cents/kWh in the most attractive projects today.

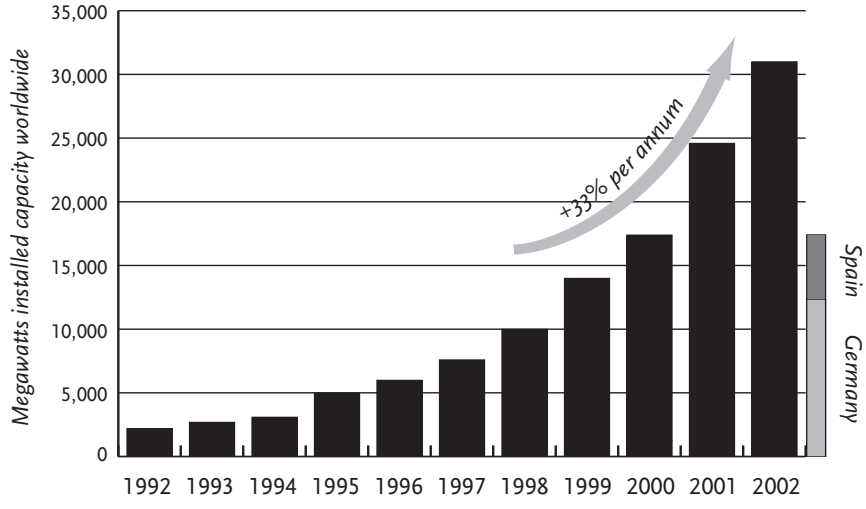


Figure 3 GROWTH OF GLOBAL WIND ENERGY CAPACITY 1992–2002
Data Source: BTM Consult

In addition to this long-term influence of politics, an interesting analysis from Bishop and Stettler (2003) demonstrates that there is also a measurable short-term influence of regulatory decisions on wind energy companies. They plotted the share prices of four listed wind energy pure plays in the period before and after the latest PTC extension in March 2002. In the few days following the PTC extension, share prices of those companies with a significant exposure to the US market, namely Vestas and NEG Micon, appreciated by more than 30% (see Fig. 4).

Because the influence of politics on the wind energy market is clearly documented, the important question is: what can a company such as Vestas do to manage this? First of all, it appears that it can easily become a victim of unpredictable changes in the policy framework. The 1986 collapse of the US market was one example, and stop-and-go policies continue to characterise US wind energy policy today. When the PTC once again expired at the end of 2001, Vestas had anticipated a PTC extension before year-end, similar to 1999. Therefore it had kept its capacity at levels that would enable quick response to increasing demand at the beginning of 2002. However, legislation was delayed in the political process, and 1,200 Vestas employees had to work short hours for three months.

That is not to say that Vestas has not worked to actively influence the political process. In fact, the decision to situate the planned US manufacturing facility in Portland, Oregon, was directly related to political support for wind energy. As the company announced the plan for the Portland plant, CEO Johannes Poulsen stated outright:

> The strong regional support of wind energy generation and considerable support for the extension of the Production Tax Credit, made by particularly Governor John A. Kitzhaber and his staff, Portland Mayor Vera Katz and staff, Port of Portland Director Mr Bill Wyatt has confirmed our belief that Portland and Oregon is a good strategic fit for Vestas (Vestas press release, 3 April 2002).

And, even after the company had to withdraw its plans following the decline in US business, the governor of Oregon continues to be a strong supporter for Vestas when it comes to making the case for wind energy in the political debate in Washington, DC.

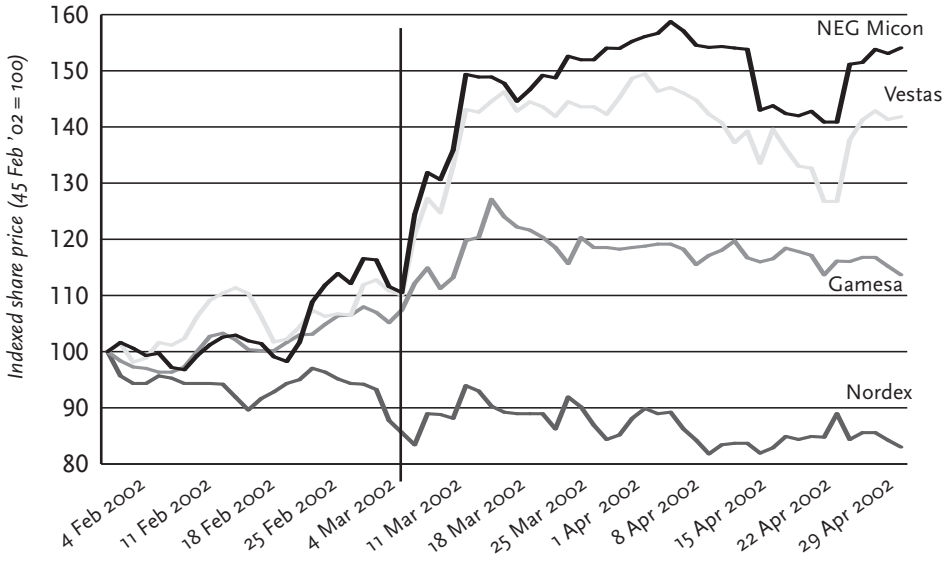


Figure 4 SHARE PRICE PERFORMANCE OF WIND ENERGY STOCKS FOLLOWING THE 9 MARCH 2002 PTC EXTENSION

Source: adapted from Bishop and Stettler 2003

Data: Copenhagen Stock Exchange, Yahoo Finance

Social responsibility and environmental management

Finally, we come to those issues that are most commonly associated with sustainability in the context of large companies. It is no coincidence that this section is at the end of the factors that we identified for Vestas's success. As the company has grown from a small pioneer to a major industry leader, more formal aspects of social responsibility and environmental management have come into place. But, rather than being the origin of Vestas's sustainability management, these systems can be seen as supporting the company's core sustainability mission, which is to focus on an environmentally benign technology and to transform the electric power industry by growing the market share of wind energy.

In August 2000, Vestas achieved ISO 14001 certification for the environmental management system established at the Danish parent company. CEO Johannes Poulsen explained the relevance of this step for the company as follows:

> Vestas has always given high priority to the environment, but it is only now that we have received certification of our environmental management system that we are able to document our efforts. Wind turbines themselves are environment-friendly, so it is naturally important to us that they are also manufactured and maintained in an environmentally responsible manner (Vestas press release on ISO 14001 certification, 23 August 2000).

In May and July 2002, respectively, the Italian and three Danish subsidiaries followed. As for occupational health and safety, the parent company completed certification according to the British OHSAS 18001 standard in August 2001. Further certification processes are under way. Today, thanks to this formalisation of environmental, health and safety management in combination with the environmental advantages of its product, the company is included in all major sustainability stock indices: namely, the Dow Jones Sustainability World Index (DJSI World), the Dow Jones STOXX Sustainability

Index (DJSI STOXX), the FTSE4Good Europe Index, and the FTSE4Good Corporate Social Responsibility Index.

Nevertheless, as a pioneer that has lived through the ups and downs of the wind industry, the company is well aware that good social and environmental performance is not enough to be sustainable, as a statement from its annual report points out:

> Social responsibility is a natural part of Vestas' management philosophy and value set, and Vestas exercises its social responsibility both internally within the Group and externally with reference to the surrounding community. Vestas' desire for sustainable development for the company encompasses social responsibility, environmental responsibility and financial profitability (Vestas 2003a: 16).

Outlook: defending a leading position in a changing market

As indicated above, simultaneously with the changing of the guard at Vestas, market conditions have significantly changed in the industry. A number of challenging factors are currently coming together: the US power market is facing overcapacities in the aftermath of the gas bubble, reducing the attractiveness of new power generation capacity; US utilities' credit ratings have deteriorated, making it more difficult for Vestas's US customers to develop projects; the US dollar exchange rate has declined, making Vestas's exports less competitive; Vestas faces strong competition from GE in North America; the German on-shore market is saturating; promising new growth markets such as France seem not to be getting off the ground, while European offshore markets are characterised by delays and demanding technological issues. Finally, the financial community criticises Vestas for its high degree of vertical integration that leverages the current market downturn. The new CEO, Svend Sigaard, can certainly not complain about a lack of challenges. The question arises whether the core competences of Vestas—growing organically and acting as the vertically integrated market leader—will be a successful model in a potential phase of industry consolidation. In terms of Vestas as an organisation, after years of hypergrowth with little time to consolidate, followed by an unfamiliar experience when almost 10% of the employees were made redundant at the end of 2002, it remains to be seen how the company makes the transition from seemingly effortless growth to what might become a new turnaround situation.

At least there is little doubt that the market potential for wind energy continues to be huge: governments around the world are struggling to achieve Kyoto targets and wind energy is practically the only renewable energy technology that is very close to being cost-competitive today. So, if the sustainability analysts are right, Vestas should be able to bear that challenge successfully and reinvent itself once more in its long history. Building on the entrepreneurial qualities that have characterised the company since the days of blacksmith H.S. Hansen and his son will certainly help.

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